Castilleja

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Aquilegia laramiensis, by Isobel Nichols

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Adventures in Laramie-Peak-Land

By Hollis Marriott

What does it take to convert a middle-aged construction worker with a big 4-WD pickup truck into a field botanist looking for rare plants? "Impossible!" you are probably thinking to yourself. But strange things can happen in the land of the Laramie Batholith and the Central Metamorphic Complex.

The Laramie columbine, *Aquilegia laramiensis*, is endemic to the Laramie Mountains in southeast Wyoming. It was discovered by Aven Nelson in 1895 on a botanizing trip on and around Laramie Peak. The flowers of this little columbine are nodding, and are borne among the leaves. They have greenish-white to lavender sepals, and cream to lavender petals with spurs less than 10 mm long.

Prior to the 2003 field season, *Aquilegia laramiensis* was known from just 12 sites, two of which were considered historical without precise location data. Most were in the northern part of the Laramie Mountains, in the vicinity of Laramie Peak. The columbine also occurs on Ragged Top Mountain about 60 miles to the south, and Char Delmatier found it roughly halfway between Laramie Peak and Ragged Top in 1993. Most of the known populations were growing on granite rocks. The columbine appeared to be rare, but those in the know suspected that there was much potential habitat needing survey. (continued p.4)

WNPS NEWS –

2004 Student Scholarship Winners: Three WNPS Scholarship winners were recently named by the Board, including:

- Elizabeth Saunders, awarded $500 (first place) for research as part of her Masters thesis "Taxonomic and systematic test of the *Abronia ammophila – Abronia mellifera – Abronia fragrans* species-complex using genetic markers". Saunders is working with Sedonia Sipes in the Department of Plant Biology at Southern Illinois University, Carbondale.
- Evelyn Hill, awarded $300 (second place) as part of her masters thesis "An Ethnobotany of the Teton Ecosystem". Hill is working with Gregory Brown in the Botany Department at University of Wyoming, Laramie.
- Sally Madden, awarded $200 (third place) as part of her masters thesis "Long term effects of domestic livestock removal from Wyoming big sagebrush dominated rangelands: vegetative diversity and soil stability". Madden is working with Larry Munn in the Department of Renewable Resources at University of Wyoming, Laramie.

We are proud to support their research. The Board had a hard time sorting through many qualified applications. They thank all who applied… and all who keep the scholarship fund going!

Wyoming Native Plant Society
P.O. Box 2500, Laramie, WY 82073

Announcing the New Board
President: Jean Daly (Big Horn) – 674-9728
Vice President: Melanie Arnett (Laramie) – 742-0988
Sec.-Treasurer: Drew Arnold (Laramie) – 742-7079
Board Members: Kent Houston (Cody) – 527-6572
Katherine Zacharkevics (Spearfish, SD) - 605-642-2240
THANK YOU to all candidates

Responses to the winter timing of elections and renewals were outstanding! The top field trip choices were the Black Hills and Laramie Peak. Board planning is in progress. The May issue will come out early to announce the annual field trip plans.

CELEBRATING WILDFLOWERS at the Draper Museum of Natural History in Cody, WY, cosponsored by WNPS, features an exciting public presentation, hikes, and workshops – mainly on Saturday, June 5. Watch for details in the spring newsletter!

New Members: Please welcome the following new members of WNPS: Sarah Bucklin-Comiskey (Casper), Andrea Cerovski (Lander), Gov. Mike & Jane Sullivan (Casper), Ron Toman (Burr Ridge, IL), Klara Varga (Ashton, ID).

MESSAGE FROM THE PRESIDENT

Thank you for your vote of confidence. I will work hard on your behalf. So far we have evaluated the scholarship applications, worked on the summer field trip, and a few members are working with the Draper Museum of Natural History on the program "Celebrating Wildflowers."

Please feel free to communicate your ideas and suggestions for the society either to me or one of the board at any time. Your input is greatly appreciated. This is your native plant society and we look forward to working with you. A very special thanks to all of you who contributed toward the scholarship fund.

Hop on board with ideas, suggestions and help anytime. I am looking forward to working with all of you. JD

Contributors to this issue: Jean Daly (JD), Bonnie Heidel (BH), William Jennings (WJ), Hollis Marriott (HM), Deanna Rhyner (DR).

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Please send announcements of summer events to report in the next issue by 19 April.

Living Floras

Keeping Score of the Score-keepers

Floras and our understanding of them are never static but always growing and changing. The vehicle for understanding them and the springboard for many other branches of botany are herbaria. The first nationwide study published in Systematic Botany (Prather et al. 2004a) documents the overall decline in the rates of plant collecting in the United States.

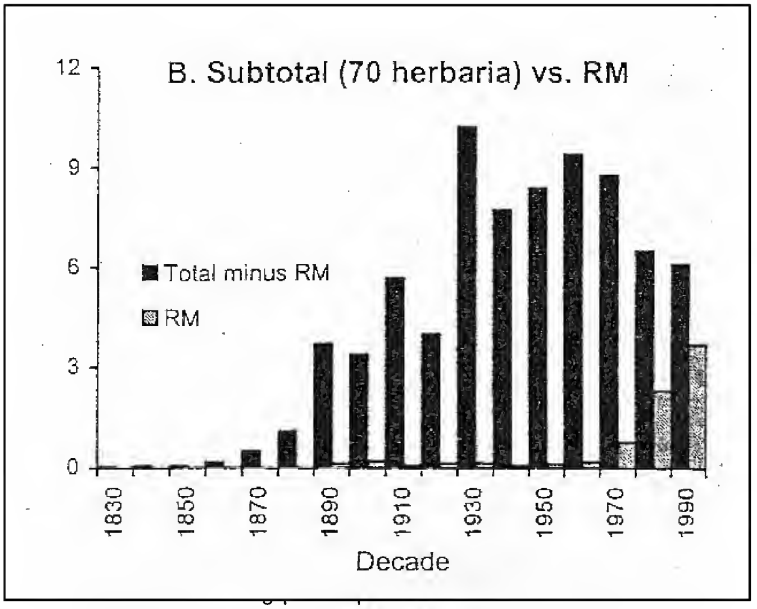
Plant collecting trends were gauged by compiling data from 71 herbaria in 30 states, based on plant specimens collected in the primary geographic area covered by that institution, for nine widespread genera selected as representative of a wide range of growth forms, life cycles, habitats, and higher taxonomic levels of classifications. Herbarium collection data were analyzed relative to herbarium accession size and region of the country.

Six trends emerged from the analysis:

1. The past 40 years (1960's-1990's) has witnessed declines in collecting for most (67.1%) herbaria
2. The pattern of decline is common to all regions, with the lowest rates of decline in the herbaria of the Rocky Mountain states
3. Overall patterns of collecting show general increases up to the 1930's and patterns of fluctuations since that time
4. The pattern of collecting for more herbaria peaked in the 1930s compared to any other decade period
5. The volume of collecting over the years varies greatly between institutions
6. The trend of decline is common to herbaria of all sizes (EXCEPT the Rocky Mountain Herbarium; RM)

What is at stake? A companion commentary by Prather et al. (2004b) discusses declines in collecting as reducing the likelihood of discovering as-yet undiscovered species, documenting fundamental distribution patterns, tracking the distribution changes of exotics and the shift of native species over time with invasions, habitat losses, and climate changes, and increasing the likelihood of missing extinction events and evolution in action. There are many caveats and variables to consider, but the trend is clear.

Bucking downward trends is the Rocky Mountain Herbarium (RM; University of Wyoming). Thirty-eight percent of the total number of 1990s specimens in the nationwide sample of the select genera were from RM, over 40X the average for the other 70 herbaria.



Rocky Mountain Herbarium for nine representative genera (y axis= 1000's; from Prather et al. 2004a)

Plant collecting is a form of botanical score-keeping that will never become a competitive sport and is best pursued in collaboration. Yet anyone who has been following UW football will understand why Greg Brown, Botany Department chairman, praised the herbarium by comparing it with sanctioned sports: "If the University had a major sports team that ranked in the top 20 every year for the past 25 years, that would be **big** news" (Eisenhauer 2002). The RM is an academic facility that is recognized in a category of its own.

Wyoming can celebrate. Next time you're at RM, congratulate Ronald Hartman, curator, and B.E. "Ernie" Nelson, collections manager; every botanist who contributed collections to RM, and the entire herbarium workforce. At the same time, it is important to consider multi-state perspectives as well as gaps in the professional documentation practices of public land managing agencies and local weed boards, and to think of ourselves as part of a larger botanical community incorrigibly linked to living floras.

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Prather, L.A., O. Alvarez-Fuentes, M.H. Mayfield, and D.J. Ferguson. 2004. The decline of plant collecting in the United States: a threat to the infrastructure of biodiversity studies. Systematic Botany 29(1):15-28.

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Adventures in Laramie-Peak-Land – cont. from p. 1
The Laramie Mountains are very rocky, with many areas of extensive outcrops. Access is difficult due to rugged topography, lack of roads and a mixed ownership pattern of public and private lands.

Three other columbines with cream, blue or lavender flowers occur in Wyoming: *Aquilegia coerulea*, *A. brevistyla* and *A. jonesii*. Of these only *A. coerulea* is known from southeast Wyoming -- in the Medicine Bow Mountains and at a single site in the southern Laramie Mountains -- but has not been documented within the range of the Laramie columbine. *A. coerulea* can be easily distinguished by the much larger flowers with spurs 20-50 mm long.

Last May I got a call from WY Natural Diversity Database Botanist Bonnie Heidel, who asked if I had any interest in doing field surveys for the Laramie columbine. With a busy summer teaching schedule ahead, I declined. But as soon as I had hung up the phone, a light bulb went on. I realized that I knew The Perfect Person for the job. Enter the middle-aged construction worker with a big 4-WD pickup truck.

The northern Laramie Mountains where most of the columbine populations had been found is underlain by the Laramie Batholith – a huge mass of granite estimated to be 2.567 billion years old, give or take 25 million years. This granite is much older than the better known Sherman granite along I-80 between Laramie and Cheyenne. Laramie granite outcrops occur as far south as the Laramie River, south of which gneisses of the Central Metamorphic Complex are exposed. Both types of rock can form large outcrops to several hundred feet in height. In some areas, ridge crests are made up of several miles of rock outcrops. These large masses of granite and gneiss had attracted the interest of several local rock climbers in the past, always in search of the perfect cliff.

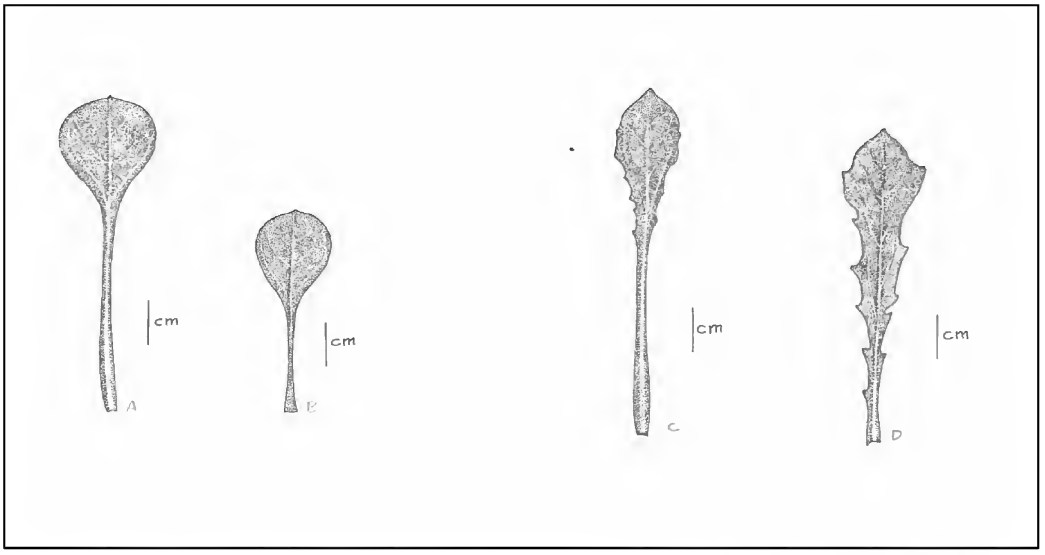
So I called Dennis Horning, who had done a lot of exploring in the northern Laramie Mountains looking for high vertical rock faces, and asked him if he had any interest in doing field surveys. He said "yes," and in June, he and his dog headed off into the rugged backcountry of the Laramie Batholith and Central Metamorphic Complex in search of the Laramie columbine. Six weeks later there were 21 new sites on record, as well as detailed information regarding habitat and potential threats. Man and dog were tired but were enjoying the satisfaction of discovery. The truck had many new scratches and had lost one side mirror, but otherwise was in good shape.

With the results of the 2003 field season in, *Aquilegia laramiensis* has proven to be a difficult species to categorize in terms of conservation status. We found many new sites, but most are within an area approximately 35 air miles in length in the northern Laramie Mountains. Populations are small, ranging from 10 to 500 plants at a given site. Size estimates are surely conservative at the larger sites, where complex systems of rock outcrops are impossible to survey in any reasonable amount of time, beyond a limited sampling. However, it is clear that the columbine occupies only a small fraction of the rock at a site. It grows as scattered patches on suitable microsites with some soil development, shaded usually by aspect or overhanging rock.

No significant threats to overall viability of the Laramie columbine are apparent. At some sites, collecting for cultivation is a potential concern, but most of the rugged habitat of the columbine is difficult to access. Grazing, timber harvest and recreation do not pose obvious threats at this time.

There has been concern that fire could damage or extirpate *Aquilegia laramiensis* populations. Based on observations in 2003, it appears that fire is not a threat to the columbine in most cases. Many populations, and all of the larger ones, occur on large rock outcrops with little tree cover and little fuel in general. Shading usually is provided by aspect and topographic position rather than tree cover. It was found in several areas where in 2002 fire had come quite close to microsites where the columbine was growing. However, without baseline information for comparison, it is impossible to confidently assess the species' tolerance of fire.

Discovery of new sites and lack of threats suggest that conservation ranks for *Aquilegia laramiensis* be reconsidered. However, its limited range and small population sizes suggest caution. We recommend that additional survey for the species be done first, in the southern part of its range where land ownership, land use and access may present problems not recognized at this time. HM



Illustrations by
Carolyn Crawford

Left pair:
Physaria acutifolia
Right pair:
Physaria vitulifera

(All specimens
from COLO)

The Status of *Physaria vitulifera* in Wyoming

By William Jennings

As part of the "Linked Databases and an Interactive Key for the Vascular Flora of the Southern Rocky Mountain Region" grant, awarded to Rob Guralnick, Ron Hartman, Tom Ranker, Mark Simmons, and Neil Snow, I was asked to visit all the regional herbaria to determine the extent of misidentifications in the specimen database. Eventually, the computerized databases of the specimen labels will be accessible through the key, and the reliability of the identifications needed to be estimated. The specimens of 25 species in a variety of families were checked at each herbarium. Overall 2848 specimens of the 25 species were examined. The error rate was very low, but one species was problematic - *Physaria vitulifera*. Of the 101 specimens so identified at RM, CS, COLO, GREE, and KHD, 29 were misidentified. As a result, I returned to examine Colorado specimens of *Physaria* at CS, COLO, GREE, and KHD (RM not yet checked).

In general, species of *Physaria* in Colorado have separate ranges, and it is unusual for two species to occur in the same area. The range of *Physaria vitulifera* is limited to the east slope of the Front Range in Colorado (endemic to Colorado). The northern limit of its range as currently known is in South St. Vrain Canyon, near Lyons, Boulder County. No specimens have been seen from Larimer County. There is a single outlier from Weld County, taken from the bed of the South Platte River at Evans in 1910 (Johnston 633, GREE). Seeds, fruits, or plants were apparently washed down the river and established themselves for a short time. There is also an old specimen (1901) from along the South Platte at Valverde (Dwight 2, COLO), approximately where West Alameda Avenue crosses the river. Again, it is presumed that it was washed down the river from Platte Canyon, where modern specimens are known. Specimens in natural habitats are known from a short distance to the west of this site on Green Mountain, southeast of Golden. There are numerous specimens from Boulder, Jefferson, Gilpin, Clear Creek, Douglas, and El Paso counties. counties. There is a single specimen from southwestern Park County (Orthner 502, COLO). The southern limit of its range appears to be Cheyenne Mountain, just southwest of Colorado Springs.

In my opinion, all the specimens from Wyoming attributed to *Physaria vitulifera* are in fact *Physaria acutifolia*, the common species of *Physaria* in southern Wyoming. The confusion apparently originated from early annotations by Reed Rollins. Rollins is widely regarded as THE expert in the Cruciferae, and his career culminated in the publishing of his monumental "The Cruciferae of Continental North America" in 1993. However, Rollins' concepts in *Physaria* changed over time, and he did not re-annotate the collections. Four Colorado endemic species new to science were described by G. A. Mulligan in the 1960's (*Physaria bellii, Physaria rollinsii*) and by Rollins in the 1980's (*Physaria obcordata, Physaria alpina*). Collections made by Rollins in the West in 1983 are in accordance with his 1993 monograph, but many earlier specimens of his own (some as recent as 1979) and annotations on collections by others are not. In the monograph, Rollins attributes *Physaria vitulifera* to "Central Colorado." There is no mention of the species being in Wyoming, in spite of the fact that his annotations from over half a century ago place it there.

Physaria vitulifera usually has very characteristic pandurate leaves. Fruits show a broad apical sinus between the valves, with no sinus or a very shallow one below. *Physaria acutifolia* typically has a round leaf blade, with no teeth on the rather long petiole to give it the pandurate shape. The apical and basal sinuses of the fruit are usually about equal in depth (see illustration).

A second result of the reconsideration of the *Physaria* specimens was that two specimens from extreme northern Colorado (Weld County) were identified as *Physaria brassicoides* (Harmon 8900,

Harmon 8911, both GREE). This is a relatively rare species of southeastern Montana, western North Dakota, western South Dakota, eastern Wyoming, and western Nebraska, and is the only *Physaria* on the Great Plains. The type specimen was taken by P. A. Rydberg at what is now Scotts Bluff National Monument. This population is the only one known for Nebraska. The Weld County sites extend the range south from Laramie County, Wyoming (Dorn 4975, COLO). Dr. Neil Snow of University of Northern Colorado has included this find in a brief article submitted to the journal Madrono. WJ

Invasive Species and CBM development in the Powder River Basin, Wyoming

By Erin Bergquist

(Editor's note: Erin Bergquist is the 2003 recipient of the Wyoming Native Plant Society Scholarship, completing her thesis at Colorado State University.)

Coal bed methane (CBM) is one of the fastest growing segments of the natural gas market. It occurs in close association with coal, but is considered less ecologically intrusive to extract and burns cleaner, giving off less polluting emissions. The development of CBM has expanded rapidly in the Western United States. Much of the development is occurring in Wyoming, especially in the Powder River Basin in the northeastern part of the state. It is estimated that there are as many as 1.1 trillion cubic meters, or a year's gas supply for the United States of recoverable CBM in the Powder River Basin. From 1997-1999, 4,379 CBM wells were developed in the Basin. By 2001, there were 14,714 wells, with plans to increase this number to 50,000 by 2020. This large-scale development of coal bed methane drilling in the Powder River Basin could have negative impacts on the native vegetation and facilitate of the spread of non-native species.

CBM wells disturb the natural landscape with the construction of pads, pipelines, roads, dams, and facilities that may spread the invasion of non-native plant species. Groundwater that is pumped out as part of the drilling process could also have impacts on native vegetation and facilitate the invasion of non-native plant species, through impacts on native plant growth, changes in soil characteristics, and water quality changes.

My thesis project was to provide a baseline survey of native and non-native vegetation in the Powder River Basin on CBM sites exposed to road and pipeline construction, pad development, discharge waters, and secondary disturbances, working in conjunction with the U.S. Geological Survey (USGS) and Colorado State University researchers.

Thirty-six modified Forest Inventory and Analysis (FIA) plots were established to evaluate the potential effects of coal bed methane development on non-native species distribution and patterns of invasion. The FIA plots are composed of four circular subplots each covering an area of 168 m^2. On average, control plots contained 3.9 ($\pm$ 0.2) non-native species and 15.8 % ($\pm$ 2.0) cover. Native richness was greater, averaging 16.2 ($\pm$ 0.8) species per plot and 38.4 % (+ 2.2) cover. Secondary disturbances were similar to control sites with slightly higher non-native species richness and cover. Surface disturbances associated with CBM development, such as roads and pipelines, increased non-native species richness and almost doubled the proportion of non-native species cover. Discharge sites had greater non-native cover and proportion of cover than control sites, nearly twice the number of non-native species, and almost four times the soil salinity.

The results showed that previous human disturbances have already had effects on the vegetation as seen in the control sites. Even without CBM development, there is invasion of non-native species occurring. But, disturbances related to CBM development have increased the already high cover of non-natives. The discharges sites have the greatest cover and species richness of non-natives, while the pad sites are the most heavily impacted with significant decreases in total and native cover and species richness. On the local landscape, the pads and associated infrastructure have quite a drastic effect, while the surface disturbances, and discharge areas have effects at the landscape level.

These results suggest that CBM development and associated disturbances facilitates the establishment of non-native plants. Future research should consider the cumulative landscape-scale effects of CBM development on preserving native plant diversity.

Botrychium lineare (Narrowleaf grapefern) confirmed in Wyoming

By Deanna Reyher

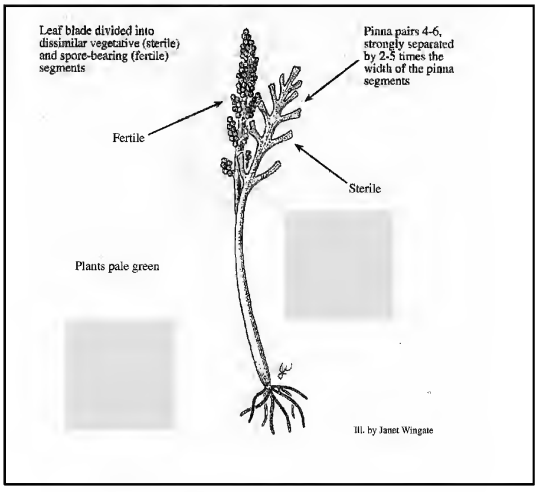
A *Botrychium* species occurrence was located in the Black Hills National Forest, Crook County, Wyoming on June 19, 2003 by Drew King and Cheryl Mayer. One of the *Botrychium* species at the site had the appearance of *Botrychium campestre* (prairie moonwort) based on morphological characteristics. Because of the interest in that species, Reed Crook joined Drew and Cheryl, and the group spent additional time intensively searching the immediate and adjacent area. Additional documented plants with differing morphological characteristics indicated that more than one species occurred at this site.

Based on recent experiences with *Botrychium* species in the Black Hills and identification challenges in this genus, the Forest has taken additional steps to confirming species identity. The Forest collects and sends fresh *Botrychium* plant specimens to Dr. Donald Farrar at Iowa State University. Lab analysis completed at Iowa State University is used to confirm species identification. It was through this effort that Dr. Farrar confirmed that *Botrychium lineare* (narrowleaf grapefern; slender moonwort) occurs in Wyoming in December 2003.

A characteristic habitat, if there is one, cannot be described for this species in the Black Hills based on only the one known Wyoming site, let alone for the other areas where it might occur within Wyoming. The species has been found associated with a wide variety of ecological conditions and range of elevations (0 to 10,000 feet) across its distribution. Some similarities between habitat conditions at this site in comparison to other known occurrences include: the species colonized an old disturbance (i.e. old native surface roadbed), the site continues to receive low levels of natural and activity-associated disturbances that may be maintaining appropriate site conditions for this species, the microhabitat is open with no tree canopy though there is deciduous cover below and coniferous cover above, and the relatively coarse-textured soils at the site have formed from parent materials that include limestone. The Black Hills NF occurrence is distant from the nearest occurrences in the Roosevelt National Forest of north-central Colorado and from Glacier National Park in northwestern Montana. Similar habitat may be present in other montane areas of Wyoming, such as in the Big Horns.

Dr. Farrar is working on *Botrychium lineare* taxonomy and has run electrophoretic analysis on plants from all currently known locations. Based on his work, *Botrychium lineare* has been documented to be quite variable from site to site. Based on the similarities that he has found between Botrychium lineare and Botrychium campestre, the question has been raised as to whether the two species warrant taxonomic distinction.

Botrychium lineare is a candidate for listing as Threatened under the Endangered Species Act (USDI Fish and Wildlife Service 2000). It is also a sensitive species in the Rocky Mountain Region of the U.S. Forest Service; summarized in Beatty et al. 2003). The Wyoming data and other new species distribution data from other states are being compiled by U.S. Fish & Wildlife Service in Boise, ID.



Botrychium lineare, by Janet Wingate

The following description for *Botrychium lineare* is taken from the species monograph (Wagner and Wagner 1994) and the Colorado Rare Plant Field Guide (Spackman et al. 1997): *Botrychium lineare* has a leaf blade divided into vegetative (sterile) and spore-bearing (fertile) segments. It is 6-18 cm tall. The vegetative segment is pale green, with pinnae that are narrowly-linear or linear-spatulate, in 4-6 pairs, strongly separated by 2-5 times the width of the pinnae. By comparison, *B. campestre* has a broader and fleshier rachis, a fertile segment with fleshier, denser sporangia, and may have overlapping or fused pinnae.

Literature cited

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Underground Phytoterrorism

Invasive noxious weeds, such as species of *Centaurea* (Asteraceae), establish monocultures in new settings by displacing the native vegetation. It is widely-thought that the absence of "natural enemies" represents an ecological vacuum (Keane and Crowley 2002). But species in the *Centaurea* genus also come with an effective arsenal.

The European spotted knapweed (*Centaurea maculosa* Lam.) releases catechin; an allelopathic agent in levels that are more than double those found in habitats that do not have *C. maculosa*. In a past September issue of Science, researchers at Colorado State University show that (-)-catechin inhibits growth of a number of nature North American plants by altering gene expression, resulting in extensive root death. Bais et al. observed that when field soil was supplemented with "invasive" levels of (-)-catechin, the germination and growth of two native grasses were dramatically reduced compared with more resistant European grasses given the same treatment. Catechin-exposure at the cellular level revealed a wave of cell death, starting at the root tip that proceeded through the central elongation zone toward the stele.

The authors conclude:

> "The case we have presented here for allelopathy in *Centaurea maculosa* challenges the conventional ecological perspective that a species' invasiveness is mainly due to enhanced resource competition after escape from natural enemies and highlights the role for the biochemical potential of the plant as an important determinant of invasive success."

Other dogmas about the peaceful rhizosphere and well-meaning exudates are under scrutiny (Bais et al. 2004). BH

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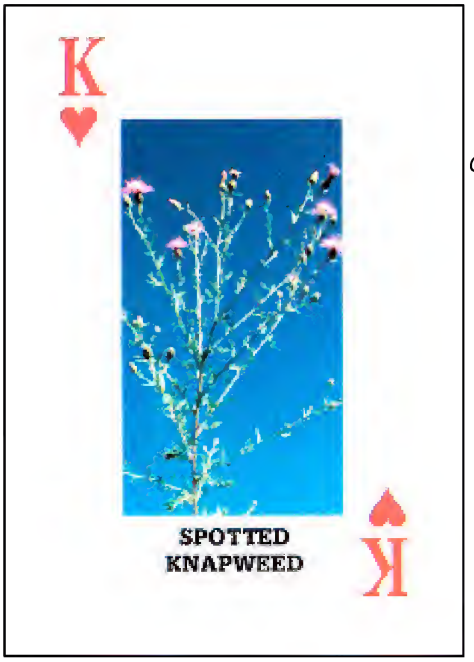
Bais, H.P., R. Vepachedu, S. Gilroy, R.M. Callaway, and J.M. Vivanco. 2003. Allelopathy and exotic plant invasion: from molecules and genes to species interactions. Science 301(5638):1337-1338.

Bais, H.P., S.W. Park, T.L. Weir, R.M. Callaway and J.M. Vivanco. 2004. How plants communicate using the underground information superhighway. Trends in Plant Sciences 9(1):26-32.

Keane, R.M. & M.J. Crawley, 2002. Exotic plant invasions and the enemy release hypothesis. Trends in Ecology and Evolution 17: 164-170.



Centaurea maculosa (Spotted knapweed) is a real heart-breaker on Wyoming rangelands.

From: Wyoming Weed & Pest Council card deck

Know-Your-Terrorists

Trump your friends with toadflax - noxious weed playing cards are available from the Wyoming Weed and Pest Council. These playing cards feature the noxious weed photos that are in the Wyoming Weed Handbook (Series 1-55). The complete Handbook is also available and presents the facts to go with the photos.

As a third option, individual postcards are available. The postcards are identical to the Weed Handbook pages, essentially loose copies with a photo on one side and the species facts on the other describing species' growth habitat, leaves, stem, flower, roots, seeds, and general information about invasiveness. Note: The weed facts do not leave room for adding an address and actually mailing them as postcards, so you cannot "say-it-with-weeds" unless you mail them as part of first class postage. The playing cards, handbook, and postcards are available for the following prices:

Weed ID Playing Cards @ $5.00
Wyoming Weed Handbook (Series I-55) @ $7.00
Weed postcards (any of 62 species, including all designated noxious weeds in Wyoming) @ $0.10

These and other items are available by sending your order with name, address and check payment to:

Wyoming Weed and Pest Council
P.O. Box 728
Douglas, WY 82633 (no credit card orders)

For the list of all non-native species in Wyoming, refer to the Rocky Mountain Herbarium homepage and posted list of Wyoming invasives (Hartman, R. and B.E. Nelson 2000; http://www.rmh.uwyo.edu/), and to *Castilleja* (Fertig, W. 1999. Non-Native Plants of Wyoming. *Castilleja* 18(2):7-10.)

Botanist's Bookshelf

A Region of Astonishing Beauty

by Roger L. Williams. 2003. Roberts Rinehart Publishers, Lanham, Maryland. 209 pp.

Genus and species epithets of plants that are all around us and the authority abbreviations affixed to them hold the names of people we recognize but scarcely know. Who were these pioneering botanists? As we walk among the Rocky Mountain flora, what can we learn by their paths?

Review by Bonnie Heidel

Roger L. Williams, Distinguished Professor of History Emeritus and former History Department head at the University of Wyoming, is rooted in the history of Europe and the history of scientific inquiry just as firmly as the flora of the Rocky Mountains (Nelson and Williams 1992) and the windblown Laramie Basin. Out of his eclectic expertise, and the "abetting" of long-standing friends, arose a superlative documentary, *A Region of Astonishing Beauty*. Williams' indubitable command of history, geography, and human stories are engaging. Each chapter in *A Region of Astonishing Beauty* is recommended reading in its own right. The breadth of this undertaking also casts light on the history of botany as it developed into a separate scientific discipline during the 19th century, and its place in the course of regional history.

Twenty-five botanical explorers, variously trained in botany as well as theology, medicine, horticulture, and geology are prominently featured in 19 chapters that follow general chronological order. The title is taken from a statement by Edwin James, the first botanist to explore the alpine flora in the Rocky Mountains, at Pike's Peak (Benson 1988).The botanical explorers also include Meriwether Lewis, Thomas Nuttall, John Charles Fremont, Ferdinand Hayden, Marcus Jones, Per Axel Rydberg, and Aven Nelson presented in adroit and scholarly text, with no pretenses of common themes or uniform structures except for presenting a biographic sketch and the species they discovered. Quotations are used judiciously, illustrations are absent, and footnotes are faithfully recorded. Contributions to botany are the focus, and not the adventure tales en route. Williams is respectful and skilled at presenting the individuals, sometimes framing questions without concocting answers, painting halos, or veering into psychoanalysis.

If there are any common threads, they are linked to the question: How do you classify life forms? This most basic intellectual problem of the 18th century with its tension between "artificial" vs. "natural" classification emerging from the Age of Enlightenment played out in the early documentation of the Rocky Mountain flora in the 19th century. The active debates shifted from taxonomic framework to more pedantic questions of nomenclatural conventions over the following century, sometimes pitting botanists of the New World and the Old, and botanists of the east and west who saw the Rocky Mountain flora differently from mounted specimens compared to fresh material. As late as 1880, only three genera were recognized by Asa Gray and Joseph Dalton Hooker as endemic to the Rocky Mountain Region: *Chionophila* Benth., *Leucampyx* Gray ex Benth. & Hook., and *Orogenia* S. Wats. Taxonomic collaborators outside the Rocky Mountain Region are profiled, too. "The long memory of such quarrels greatly contributed to the traditional conviction that botanists are by nature an exceptionally quarrelsome lot,..." Williams wryly notes.

A Region of Astonishing Beauty does not take the place of more detailed books on individual explorers (e.g., the biography of Aven Nelson published earlier by Williams in 1984). But it presents a broad cast of characters and a sense of the collective breadth and depth of Rocky Mountain botanical explorations regardless of state lines, expedition mandates, and individual predilections. Far more comprehensive treatments on the subject of North American botany explorers are presented by Reveal and Pringle (1993). Feature articles on individual botanical explorers are were also printed in this newsletter (see newsletter article index, Wyoming Native Plant Society homepage, at: (www.uwyo.edu/ /wyndd/wnps/wnps_home.htm). However, these works in their depth, scope or length limits do not convey a regional picture and the contemporaneous scientific advances in taxonomy, evolution, geology, and biogeography that changed the course of botany.

Criticisms? There are many typographical errors in the scientific names, courtesy of the spell check function built into Microsoft office products. This brand of typo provides further grounds for botanists to relate to the book.

Some of the pithiest comments of the book are in the preface and introduction, which are otherwise short, terse, and possibly prepared in haste at the culmination of this work. Williams does not address contemporary botany except obliquely:

> "Whereas in the eighteenth century lengthy expeditions or field trips, commonly of two or more years, had been the graduate schools for botanists, after about 1890 one attended a formal graduate school: and graduate degrees became the licenses to practice. Everyone is aware of what has been gained through that transition. Probably very few are conscious of what has been lost."

Who is the audience for this book? If you have read this far – it is definitely for you. Even if you don't

have time this spring, its chapters might be read casually one at a time. It might also be read as springboard to more in depth research, whether by botanists, natural history buffs, or historians. Chances are you will want to read it more than once, for the people, the places, and the plants that it presents together.

Literature Cited

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For the FULL story on *Aquilegia laramiensis* field survey results, see: Marriott, H. and D. Horning. 2004. Status of *Aquilegia laramiensis* and results of field survey. Posted at: http:/www.uwyo.edu/wyndd.

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The Wyoming Native Plant Society, established in 1981, is a non-profit organization dedicated to encouraging the appreciation and conservation of the native flora and plant communities of Wyoming. The Society promotes education and research on native plants of the state through its newsletter, field trips, and annual student scholarship award. Membership is open to individuals, families, or organizations with an interest in Wyoming's flora. Members receive *Castilleja*, the Society's quarterly newsletter, and may take part in all of the Society's programs and projects, including the annual meeting/field trip held each summer. Dues are $7.50 annually. To join or renew, return this form to:

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